CLAIMS (US)

1. An apparatus for detecting orientation of a face from image data acquired by photographing the face, the image data being composed of a plurality of pixel data aligned in horizontal direction and vertical direction, respectively, comprising:

a vertical adding section for adding the respective pixel data in the vertical direction of the image data; and

an orientation detecting section for detecting a face orientation based on a plurality of sum values calculated by said vertical adding section.

2. The face orientation detection apparatus of claim 1, further comprising:

an extracting section for extracting characteristic data of a plurality of sum values calculated by said vertical adding section; and

a characteristic table storing the characteristic data in association with a plurality of face orientations,

wherein said orientation detecting section selects, from said characteristic table, a face orientation corresponding to the characteristic data extracted by said extracting section.

3. An apparatus for detecting orientation of a face from image data acquired by photographing the face, the image data

being composed of a plurality of pixel data aligned in horizontal direction and vertical direction, respectively, comprising:

a horizontal adding section for adding the respective pixel data in the horizontal direction of the image data;

an eye detecting section for detecting an eye position in the vertical direction based on a plurality of sum values calculated by said horizontal adding section;

an eye vicinity adding section for adding the respective pixel data in the vertical direction in a vicinity region of the eye position detected by said eye detecting section; and

an orientation detecting section for detecting a face orientation based on a plurality of sum values calculated by said eye vicinity adding section.

4. The face orientation detection apparatus of claim 3, further comprising:

a maximum value specifying section for specifying a maximum value of the sum values calculated by said horizontal adding section;

a local minimum value specifying section for specifying a local minimum value of the sum values calculated by said horizontal adding section; and

a selecting section for selecting a sum value which is located higher in the vertical direction than a sum value specified as the maximum value by said maximum value specifying section and

is specified as the local minimum value by said local minimum value specifying section,

wherein said eye detecting section detects that a position in the vertical direction of the sum value selected by said selecting section is the eye position.

5. The face orientation detection apparatus of claim 3, further comprising:

a local minimum value specifying section for specifying a local minimum value of the sum values calculated by said horizontal adding section; and

a selecting section for selecting a sum value which is specified as the local minimum value by said local minimum value specifying section in second highest position in the vertical direction of the sum values calculated by said horizontal adding section,

wherein said eye detecting section detects that a position in the vertical direction of the sum value selected by said selecting section is the eye position.

6. An apparatus for detecting orientation of a face from image data acquired by photographing the face, the image data being composed of a plurality of pixel data aligned in horizontal direction and vertical direction, respectively, comprising:

a region detecting section for detecting a face region in the horizontal direction from the image data;

a nose detecting section for detecting a nose position in the horizontal direction from the image data; and

an orientation detecting section for detecting a face orientation based on the nose position detected by said nose detecting section and the region detected by said region detecting section.

7. The face orientation detection apparatus of claim 6, further comprising:

a threshold storing section for storing thresholds;

a vertical adding section for adding the respective pixel data in the vertical direction of the image data;

a comparing section for comparing a sum value calculated by said vertical adding section and a threshold stored in said threshold storing section,

wherein, when the sum value is larger than the threshold as a result of comparison in said comparing section, said region detecting section judges that the pixel data calculated into the sum value are within the face region.

8. The face orientation detection apparatus of claim 6, further comprising:

a vertical adding section for adding the respective pixel data in the vertical direction of the image data;

a variation calculating section for calculating a variation in

the horizontal direction of the sum values calculated by said vertical adding section; and

a specifying section for specifying a face outline in the horizontal direction based on the variation calculated by said variation calculating section,

wherein said region detecting section detects the face region based on the face outline specified by said specifying section.

9. The face orientation detection apparatus of claim 6, further comprising:

a pixel number storing section for storing a predetermined number of pixels;

a horizontal adding section for adding the respective pixel data in the horizontal direction of the image data;

an eye detecting section for detecting an eye position in the vertical direction based on a plurality of sum values calculated by said horizontal adding section;

an under eye adding section for adding the pixel data in the vertical direction in a region located lower than the eye position detected by said eye detecting section by the number of pixels stored in said pixel number storing section; and

a local minimum value specifying section for specifying a local minimum value of the sum values calculated by said under eye adding section,

wherein said nose detecting section detects that a position

in the horizontal direction of the sum value specified as the local minimum value by said local minimum value specifying section is the nose position.

10. The face orientation detection apparatus of claim 7, further comprising:

a pixel number storing section for storing a predetermined number of pixels;

a horizontal adding section for adding the respective pixel data in the horizontal direction of the image data;

an eye detecting section for detecting an eye position in the vertical direction based on a plurality of sum values calculated by said horizontal adding section;

an under eye adding section for adding the pixel data in the vertical direction in a region located lower than the eye position detected by said eye detecting section by the number of pixels stored in said pixel number storing section; and

a local minimum value specifying section for specifying a local minimum value of the sum values calculated by said under eye adding section,

wherein said nose detecting section detects that a position in the horizontal direction of the sum value specified as the local minimum value by said local minimum value specifying section is the nose position.

11. The face orientation detection apparatus of claim 8, further comprising:

a pixel number storing section for storing a predetermined number of pixels;

a horizontal adding section for adding the respective pixel data in the horizontal direction of the image data;

an eye detecting section for detecting an eye position in the vertical direction based on a plurality of sum values calculated by said horizontal adding section;

an under eye adding section for adding the pixel data in the vertical direction in a region located lower than the eye position detected by said eye detecting section by the number of pixels stored in said pixel number storing section; and

a local minimum value specifying section for specifying a local minimum value of the sum values calculated by said under eye adding section,

wherein said nose detecting section detects that a position in the horizontal direction of the sum value specified as the local minimum value by said local minimum value specifying section is the nose position.

12. The face orientation detection apparatus of claim 9, further comprising:

a distance storing section for storing a predetermined distance;

a distance calculating section for, when a plurality of local minimum values are specified by said local minimum value specifying section, calculating a distance in the horizontal direction between sum values specified as the local minimum values; and

a comparing section for comparing the distance calculated by said distance calculating section and the predetermined distance stored in said distance storing section,

wherein, when the distance calculated by said distance calculating section is shorter than the predetermined distance as a result of comparison in said comparing section, said nose detecting section detects that a center portion in the horizontal direction of the two sum values separated by the distance is the nose position.

13. The face orientation detection apparatus of claim 10, further comprising:

a distance storing section for storing a predetermined distance;

a distance calculating section for, when a plurality of local minimum values are specified by said local minimum value specifying section, calculating a distance in the horizontal direction between sum values specified as the local minimum values; and

a comparing section for comparing the distance calculated by said distance calculating section and the predetermined distance stored in said distance storing section,

wherein, when the distance calculated by said distance

calculating section is shorter than the predetermined distance as a result of comparison in said comparing section, said nose detecting section detects that a center portion in the horizontal direction of the two sum values separated by the distance is the nose position.

14. The face orientation detection apparatus of claim 11, further comprising:

a distance storing section for storing a predetermined distance;

a distance calculating section for, when a plurality of local minimum values are specified by said local minimum value specifying section, calculating a distance in the horizontal direction between sum values specified as the local minimum values; and

a comparing section for comparing the distance calculated by said distance calculating section and the predetermined distance stored in said distance storing section,

wherein, when the distance calculated by said distance calculating section is shorter than the predetermined distance as a result of comparison in said comparing section, said nose detecting section detects that a center portion in the horizontal direction of the two sum values separated by the distance is the nose position.

15. A method for detecting orientation of a face from image data acquired by photographing the face, the image data being composed of a plurality of pixel data aligned in horizontal direction

and vertical direction, respectively, comprising:

adding the respective pixel data in the vertical direction of the image data; and

detecting a face orientation based on a plurality of sum values calculated.

16. A method for detecting orientation of a face from image data acquired by photographing the face, the image data being composed of a plurality of pixel data aligned in horizontal direction and vertical direction, respectively, comprising:

adding the respective pixel data in the horizontal direction of the image data;

detecting an eye position in the vertical direction based on a plurality of sum values calculated;

adding the respective pixel data in the vertical direction in a vicinity region of the detected eye position; and

detecting a face orientation based on a plurality of sum values calculated for the vicinity region of eyes.

17. A method for detecting orientation of a face from image data acquired by photographing the face, the image data being composed of a plurality of pixel data aligned in horizontal direction and vertical direction, respectively, comprising:

detecting a face region in the horizontal direction from the image data;

detecting a nose position in the horizontal direction from the image data; and

detecting a face orientation based on the detected nose position and face region.

18. A computer memory product storing a computer program for causing a computer to detect orientation of a face from image data acquired by photographing the face, the image data being composed of a plurality of pixel data aligned in horizontal direction and vertical direction, respectively, said computer program comprising the steps of:

causing the computer to add the respective pixel data in the vertical direction of the image data; and

causing the computer to detect a face orientation based on a plurality of sum values calculated.

19. A computer memory product storing a computer program for causing a computer to detect orientation of a face from image data acquired by photographing the face, the image data being composed of a plurality of pixel data aligned in horizontal direction and vertical direction, respectively, said computer program comprising the steps of:

causing the computer to add the respective pixel data in the horizontal direction of the image data;

causing the computer to detect an eye position in the

vertical direction based on a plurality of sum values calculated;

causing the computer to add the respective pixel data in the vertical direction in a vicinity region of the detected eye position; and

causing the computer to detect a face orientation based on a plurality of sum values calculated for the vicinity region of eyes.

20. A computer memory product storing a computer program for causing a computer to detect orientation of a face from image data acquired by photographing the face, the image data being composed of a plurality of pixel data aligned in horizontal direction and vertical direction, respectively, said computer program comprising the steps of:

causing the computer to detect a face region in the horizontal direction from the image data;

causing the computer to detect a nose position in the horizontal direction from the image data; and

causing the computer to detect a face orientation based on the detected nose position and face region.